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VA researchers develop duct with composite materials

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WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Engineers can now use composite lay-up techniques with production equipment to build a single-piece diffusing duct using 100% composite material without fasteners. The resulting duct is lighter, stronger, and easier to manufacture than current designs. This technology will be applicable and available to a wide array of unmanned and manned air vehicles, including the Joint Unmanned Combat Air System (J-UCAS).

Air Vehicles Directorate scientists collaborated with Lockheed Martin Advanced Development Programs to successfully demonstrate Structurally Integrated Compact Inlet Technology (STRICT). Using automatic composite fiber placement and other state-of-the-art manufacturing techniques, they produced a highly compact, fully offset, single piece diffusing duct with integrated flow control devices and sensors.

Scientists overcame significant challenges while manufacturing this component. Small turn radii and lateral curvature were necessary in the duct structure for compactness but could hamper structural flexibility. The duct was manufactured as a single piece for structural integration, simplicity, and the elimination of conventional fasteners. This requirement made necessary the use of a large fiber placement machine that could reach into surfaces to create the duct.

The STRICT program was conceived to demonstrate an inlet duct enabled by flow control technology that not only satisfied aerodynamic performance requirements but was also produced using advanced composites technology. By using air flow control, STRICT allows the development of ducts that are shorter than those previously used, thus allowing smaller UAV designs.



This duct was developed by the Air Vehicles Directorate using 100 percent composite materials. The new design meets aerodynamic performance requirements. (Air Force photo)

The composites technologies employed were developed under the Air Vehicles Directorate's Composites Affordability Initiative and Inlet Aerostructural Integration programs.

The system produced in this project is sized to fit the X-45A Unmanned Combat Air Vehicle program (UCAV) engine, yet is applicable to a wide array of unmanned and manned air vehicles. @